

## A laser-driven particle accelerator with optical grating

Kirat Singh<sup>1</sup>, Jiří Petrášek<sup>2</sup>, Robert Bingham<sup>3</sup>,  
Nicholas Goddard<sup>1</sup> and Kang Xie<sup>4</sup>

1) Department of Instrumental and Analytical Science, UMIST, PO Box 88

## Abstract

We present a novel accelerating concept. A laser is used to excite a leaky mode within a vacuum waveguide. The high value of the transverse component of the electric field of the waveguide mode is used to accelerate charged particles. In order to achieve phase matching, a grat crate 5((r)6.3 (a)-0.(e ) ac8( )1)12b(at cr(a)-0.ce ) aat

extending into the vacuum region. The wave propagates along the boundary with a phase velocity that is lower than  $c$ . Thus the problem of phase slippage can be



Figure 1. The basic setup is shown here. The substrate is shaped in the form of a prism to allow prism excitation of the waveguide mode propagating in  $z$  direction. The embossed surface serves to set up a phase modulation within the waveguide core. With a suitably chosen grating amplitude and period, a relativistic particle travelling parallel to the  $x$



